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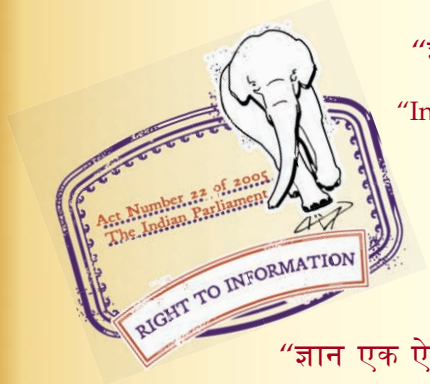

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(Reaffirmed 2001)

Indian Standard

CODE OF PRACTICE FOR HANDLING AND STORAGE OF AVIATION FUELS AT AIRFIELD FUELLING STATIONS

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

CODE OF PRACTICE FOR HANDLING AND STORAGE OF AVIATION FUELS AT AIRFIELD FUELLING STATIONS

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CODE OF PRACTICE FOR HANDLING AND STORAGE OF AVIATION FUELS AT AIRFIELD FUELLING STATIONS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 21 February 1975, after the draft finalized by the Petroleum Products Sectional Committee had been approved by the Chemical Division Council.

0.2 This code has been prepared with a view to recommending basic safety requirements for safe handling and storage of aviation fuel and to ensure that clean, dry, on-specification product of right grade is delivered to the aircraft. This code prescribes a system to maintain quality control checks and counter-checks at every stage of operation and preserve records of such checks for any future reference if need arises. Normally these practices and procedures are governed by the aircraft and engine manufacturer requirements. The procedures outlined here are the minimum requirements in order to ensure quality control and connected aspects of aviation products.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the code of practice for handling and storage of aviation fuels at airfield fuelling stations in order to ensure basic safety requirements and quality control of aviation products delivered for aircraft use.

2. RECEIPT OF FUEL

2.1 General

2.1.1 The storage tanks should be gauged to ensure that there is sufficient ullage to receive the quantity of fuel being delivered and should also be checked for water and other contaminants visually.

*Rules for rounding off numerical values (*revised*).

2.1.2 It is recommended that fuel should be allowed to settle for the maximum possible period as permitted by the storage capacity and should be used on a first-in-first-out basis.

2.1.3 It is recommended that appropriate facilities may be made available to check delivery meters on fuelling equipments.

2.2 Receiving Lines

2.2.1 A separate decanting hose should be used for decanting each product from its respective vehicle. These hoses should form permanent part of the receiving facilities, should be hung on supports with rain shields and should be adequately capped when not in use as protection against entrance of dirt and water. Each hose should be tagged and colour-coded for the product handled.

2.2.2 Pipeline and pump manifold should provide positive grade segregation in order to obviate accidental contamination.

2.2.3 A 10-micron filter of approved specification with facilities to measure the differential pressure should be installed at the inlet of the receiving tank. It is advisable that a line strainer be provided before the filter to ensure long filter life.

2.2.4 In case of multiple storage tanks of the same product interlocking isolation valves should be locked and sealed in desired position in order to prevent discharge of product into working tank wherever possible.

2.3 Receiving Fuel By Tank Truck

2.3.1 It is preferable to have the tank truck internally epicoated.

2.3.2 A suitable method for bonding the truck to the decanting point should be provided and bonding done prior to unloading.

2.3.3 The quality control release certificate should be checked to ensure that the fuel is of the correct grade. Any doubt about the grade of the fuel should be immediately brought to the attention of the supervisor before unloading.

2.3.4 The vehicle should be allowed to settle for a minimum of 10 minutes.

2.3.5 All compartments should be checked for quantity of fuel which should tally with the quantity recorded on the stock transfer challan. The seals on the tanks, barrels or other containers shall be intact and the markings on the containers shall be distinctly clear.

2.3.6 A bottom sample should be drawn from all the compartments individually and checked for appearance, water/sediment, density and temperature. Observations should be recorded in the Quality Control Release Certificate and receiving point density at 15°C should be within $\pm 0{\cdot}002$ of the recorded density at despatching point. Any water and/or sediments found should be drained till clear samples are obtained.

2.3.7 A sample should be drawn from receiving tanks and checked for appearance, sediments and water.

2.3.8 A sample from the inlet filter should be checked before and after decantation for water and sediments. Filter sump should be drained completely to remove all water/sediments found.

2.3.9 Unloading hoses when not in use should be kept properly closed and sealed at both ends. They should be inspected for protective cover and absence of contaminants prior to making connection. If hose is found to contain excessive contaminants, fuel should not be unloaded until after the hose is thoroughly cleaned or replaced with one which is acceptable.

2.3.10 Before discharge of stock, electrical continuity of the bonding wires and clips used to earth the wagon or vehicle should be ensured.

2.3.11 Whenever a tank truck is changed from one grade service to another, the necessary quality control procedure as approved by the competent authority shall be followed.

3. AIRPORT STORAGE FACILITY

3.1 Tanks

3.1.1 It is desirable to have at least two tanks for each grade of aviation fuel. A minimum settling time as approved by a competent authority should be allowed before the product is withdrawn.

3.1.2 Water checks on storage tanks should be conducted with suitable chemical devices as follows:

a) Daily morning,
b) After heavy rain,
c) Before product receipt, and
d) Before product delivery.

If water is found it should be immediately removed.

3.1.3 As far as possible each tank should be maintained exclusively for one grade of service. However, when the tanks are changed from one grade to another they should be completely emptied and cleaned prior to the change.

3.1.4 A tank cleaning report should be prepared for each tank. Each tank should be cleaned at a frequency which a study of the contaminant level noticed indicates to be necessary. However, the period between such cleanings should, in any case, not exceed two years.

3.1.5 All ATF tanks should be internally epicoated and provided with a floating suction. Floating suction should be checked regularly for satisfactory operation. Underground tank should be provided with a slope and a water draw-off arrangement from the lowest point.

3.1.6 All pipelines, valves, fittings, etc, shall be colour-coded in accordance with the colour code given in Appendix A for positive grade segregation.

3.1.7 When bulk production installations are not in use, all manhole covers, dip holes, inlet and outlet points are to be looked and sealed and the keys should be kept in safe custody.

3.2 Delivery System

3.2.1 Bottom loading connections fitted with selective couplings should be provided at all new facilities for fueller/bridger filling. They are also mandatory at loading racks where more than one grade is bottom loaded. Top filling through open manholes is not recommended. Where top filling under seal is employed and more than one grade is handled some form of selectivity should be adopted.

3.2.2 A suitable 5-micron filter water separator should be provided on the farthest end of the delivery system for each grade of product. It should be provided with a sump, drain connections and a pressure differential gauge. Samples should be checked for water/sediments before delivery of the product. Pressure differential should be recorded daily and proper records maintained.

3.2.3 Filter elements should be changed if the pressure differential across the inlet and outlet exceeds prescribed limits or if there is a sudden drop in pressure differential indicating rupture of elements. An yearly inspection should also be carried out to ensure satisfactory operation.

4. FUELLERS AND HYDRANT DISPENSERS

4.1 All aviation refueller tanks, if of mild steel, should be internally epi-coated. A sump should be provided at the lowest point and provision should be made for draining and sampling. Samples should be drawn daily and checked for clarity, water/sediments and other external impurities (*see* Appendix B for white bucket test).

4.2 All refuellers and dispensers should be provided with 5-micron filter/separators of approved specification. Provision for a sump and drain connection should be made. Pressure differential gauges should be provided and adequate records maintained. Filter elements should be changed if the pressure differential exceeds the prescribed limits or if there is sudden drop in pressure difference. An yearly inspection should also be carried out to ensure satisfactory operation. Filter sumps should be drained daily till sample free from water/sediments is obtained.

4.3 Quantity meters fitted on the refuellers should be periodically checked and sealed as required by the appropriate statutory authorities.

4.4 A 60-mesh gauze should be provided at the hose and it should be checked periodically for damage or rupture.

4.5 Refuellers/dispensers should be fitted with adequate safety devices.

4.6 Provision should be made for proper grounding arrangements and bonding with the aircraft [*see* Indian Standard code of practice for the control of undesirable static electricity (*under preparation*)].

5. HYDRANT SYSTEM

5.1 Hydrant systems should be designed according to the standards laid down by API/IP Standards.

5.2 Newly installed hydrant system should be adequately flushed prior to commissioning to ensure absence of rust/contaminants in the pipeline. Lowest point of the hydrant should be checked for presence of water every day. Similarly hydrant pits should be checked for water daily. It is advisable to have a strainer at the inlet of the system.

5.3 All hydrant outlets should be equipped with selective ground connections keyed to international selective positions gradewise. Each hydrant pit should be numbered and colour-coded for positive grade segregation.

5.4 Prior to making any connection, all couplings, valves, etc, should be thoroughly cleaned with a clean cloth to prevent entrance of contaminants into the system. Cleaning material should be non-fibrous type.

6. TESTING OF AVIATION PRODUCTS

6.1 In addition to the daily quality control checks conducted on the stocks held in the storage tanks and the refuellers, the following tests should also be carried out.

6.1.1 A nozzle sample should be checked for water/sediments prior to every refuelling. An approved chemical water detector shall be used for this purpose. Suspended water content should not exceed 30 ppm.

6.1.2 A bottom sample should be drawn every fortnight from the storage tanks and tested for silver strip corrosion test (for aviation turbine fuel only).

6.1.3 If no fresh stocks are received for three months in the tank a sample should be tested for the following characteristics by the relevant P: method as prescribed under IS : 1448* :

a) Appearance,
b) Colour,
c) Density,
d) Copper strip corrosion,
e) Silver strip corrosion (for aviation turbine fuel only),
f) Existent gum,
g) Flash point (for aviation turbine fuel only),
h) Freezing point (for aviation turbine fuel only),
j) Distillation,
k) Water reaction, and
m) Reid vapour pressure (for aviation gasoline only).

6.1.4 A sample should be tested for the 11 tests as indicated in **6.1.3** after a fresh batch is received after tank cleaning.

*Methods of test for petroleum and its products.

6.1.5 A millipore test for particulate matter should be conducted on each refuelling equipment at least once in three months (by gravimetric method) in accordance with the method given in Appendix C. Particulate matter should not exceed 0·5 mg/litre.

6.1.6 All relevant records for checks listed in **6.1.1** to **6.1.5** should be maintained.

7. SAFETY PRECAUTIONS

7.1 Aviation Fuels — These fuels are highly flammable and prevention and control of fire is an important aspect of aviation fuel handling and storage.

7.2 Fuel spills represent the greatest fire hazard and every effort should be made to minimize spillage. Since it is not possible to prevent spills altogether, proper steps should be taken to remove the spilled fuel at the earliest. Every spill should be treated as a potential fire source and no matter how small, it should be investigated as to its cause so that remedial action may be taken.

7.3 Transfer of fuel at high speeds constitutes a potential ignition source. During transfer operations all fuelling equipments should be earthed and during aircraft refuelling operations, the aircraft should also be earthed and bonded to the refuelling equipment. Checks should be carried out at regular intervals to ensure continuity of bonding wires [*see* Indian Standard code of practice for the control of undesirable static electricity (*under preparation*)].

7.4 Operation of aircraft engines or heaters or operation of automotive or other internal combustion engine servicing equipment in the vicinity of flammable fuel/air mixture are also potential ignition sources and it should be ensured that no other servicing vehicles are brought in close proximity of the fuel servicing vehicle. Open flames, arcing of electrical circuits and energy from high frequency radar equipment are some other ignition sources. Radar beam should not be directed towards any flammable fuel vapour/air mixture and care should be taken that when such operations are conducted a safe distance is kept from the radar antennas.

7.5 Flame traps should be provided for refuellers to ensure safety.

7.6 'NO SMOKING' sign should be prominently displayed to prevent accidents, by painting them on the fuelling vehicles.

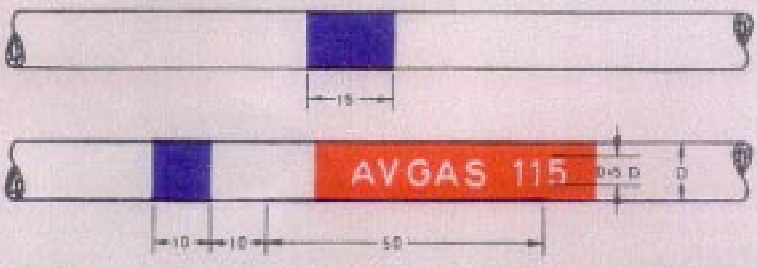
7.7 Adequate number of fire fighting equipment should be provided and regular checks should be carried out to ensure that they are in working order whenever the need arises.

7.8 All personnel handling aviation fuels should be thoroughly trained in all aspects of fire fighting and other safety precautions. Simulated fire drills should be conducted at regular intervals and contingency plans should be prepared.

APPENDIX A

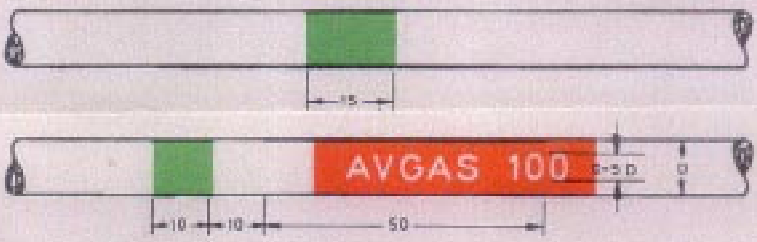
(Clause 3.1.6)

COLOUR CODING STANDARD FOR AVIATION FUELS



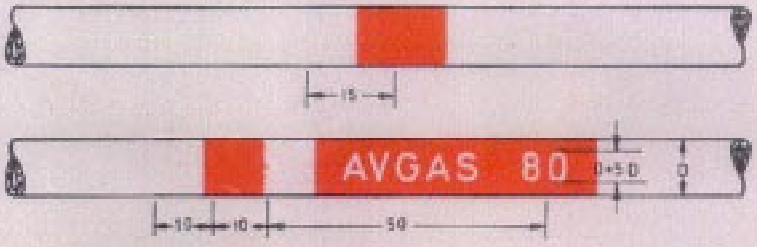
ALL VALVES, JOINTS AND FITTINGS TO BE PAINTED DARK VIOLET

AVGAS 115/145



ALL VALVES, JOINTS AND FITTINGS TO BE PAINTED TRAFFIC GREEN

AVGAS 100/130



ALL VALVES, JOINTS AND FITTINGS TO BE PAINTED SIGNAL RED

AVGAS 80/87

ALL VALVES, JOINTS AND FITTINGS
TO BE PAINTED DARK ADMIRALTY GREY

AVIATION TURBINE FUEL (KEROSINE TYPE) JP-1

All dimensions in centimetres.

Colour specification as per IS : 5-1961 Colours for ready mixed paints (*second revision*).

Name of Colours	No. of Colours
Dark Violet	796
Traffic Green	267
Signal Red	537
Dark Blue-Grey	693
Dark Admiralty Grey	632

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APPENDIX B

(*Clause* 4.1)

WHITE BUCKET TEST

B-1. White bucket test is conducted to detect the presence of solid contaminants and/or water in aviation fuels.

B-2. For the purpose of this test a suitable, clean, dry container such as a 15-litre white enamel bucket should be used.

B-3. Sufficient quantities of fuel should be drained into the container as required to get a representative sample from the sump that is being tested.

B-4. The white bucket should then be placed on a level surface and its bottom inspected for water droplets, solid contaminants and/or hazy, cloudy or discoloured fuel.

B-5. The product should be drained till a clear sample free from solid contaminant and water is obtained.

APPENDIX C

(*Clause* 6.1.5)

DETERMINATION OF PARTICULATE MATTER IN AVIATION FUELS

C-1. SCOPE

C-1.1 The method covers a procedure for taking samples of aviation fuels from fuel handling system (refuellers, dispensers, etc), through field monitors for determination of particulate contaminants by gravimetric method.

C-2. OUTLINE OF THE METHOD

C-2.1 A 5-litre fuel sample is passed through the field monitor containing a pre-weighed 0·8 μ filter membrane. After filtration the field monitor is returned to the laboratory for analysis.

C-3. APPARATUS

C-3.1 Sampling Apparatus — as illustrated in Fig. 1 and consisting of following components.

C-3.2 Sampling Valve Connection — designed to meet the following requirements :

It shall provide a suitable wall-tapping point, not protruding into the fuel line to be sampled. It shall be completely resistant to fuel and be

leak-proof up to the maximum working pressures to be encountered. It shall incorporate a self-sealing quick-action coupling designed to mate with a suitable connection leading to the selector valve of the sampling assembly. It shall have minimum of internal recesses which could cause the hold-up of the contaminants. It shall be provided with dust cap.

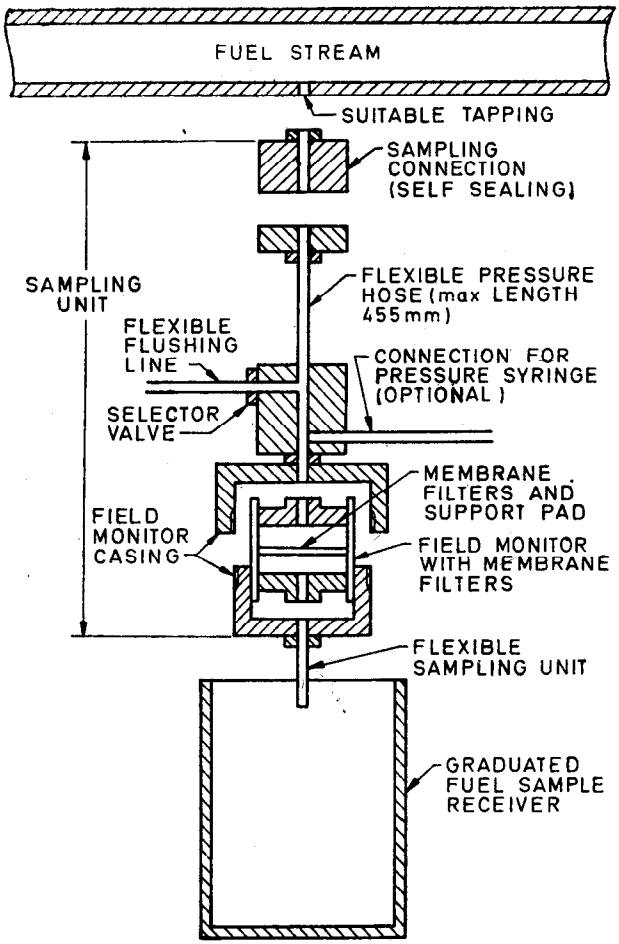

FIG. 1 FIELD SAMPLING APPARATUS

C-3.3 Selector Valve — designed to meet the following requirements:

It shall have an inlet port and two alternative outlet ports. It may also have an 'off' position. It should be so designed that it is free from internal pockets in which contaminant may be stored and subsequently released. It may also incorporate a point to which a syringe may be fixed.

C-3.4 Field Monitor Casting — designed to the following requirements:

It shall be so constructed that perfect seal is made between its upper part and the top of the field monitor and also between its lower part and the bottom of the field monitor. No fuel bypassing shall be permitted.

C-3.5 Field Monitors — complete with protective plugs and each containing a 37-mm pre-weighed 0·8 μ membrane filter backed by a support pad.

C-3.6 Graduated Receiver — capable of receiving at least a 5-litre fuel sample.

C-4. PROCEDURE

C-4.1 Select a suitable sampling point. Fix the sampling connection to the selected sampling point ensuring that its dust cap at the exposed end is in place.

C-4.2 Unscrew the field monitor casing.

C-4.3 Remove the first protective plug from the monitor and keep it in a clean safe place.

C-4.4 Locate the monitor properly in the casing.

C-4.5 Remove the second selective plug from the monitor and place it in a clean safe place.

C-4.6 Reassemble the monitor casing.

C-4.7 Ensure that the sampling line is connected to the bottom of the monitor casing and lead the free end to the graduated sample receiver.

C-4.8 Remove the dust caps from the sampling connection and the flexible pressure hose connector and connect the sampling apparatus to the sampling connection with the selector valve in the 'off' position.

C-4.9 When the desired fuelling flow and pressure conditions are established, operate the selector valve to the 'flush' position.

C-4.10 When at least two litres of fuel is collected, operate the selector valve to the 'sample' position.

C-4.11 After taking a 5-litre sample operate the selector valve to the 'off' position.

C-4.12 If it is necessary to remove fuel from the monitor, carry this out at an appropriate time using a syringe provided with the sampling kit.

C-4.13 Disconnect the sampling unit from the sampling connection and replace the dust caps.

C-4.14 Remove the field monitor from its casing and replace the protective plugs. Handle carefully. Do not open the field monitors under any circumstances before returning them to the laboratory. If they are opened discard the filters.

C-4.15 Place the field monitor in a suitable container and record the following conditions on a report form:

a) Volume of sample,
b) Monitor serial number,
c) Sample location and date, and
d) Equipment type and number.

C-4.16 Drain and dismantle the apparatus and return it to the case provided.

C-4.17 Forward the monitor to the laboratory for analysis as soon as possible.

C-4.18 The difference in the final and initial mass of the filter membrane (in mg) divided by the volume of sample (in litres) collected will give the mass in mg of solid contaminant present per litre of the fuel.

C-5. GENERAL PRECAUTIONS

C-5.1 Sampling equipment should always be handled with care and it should be ensured that it is maintained in a scrupulously clean condition.

C-5.2 To avoid extraneous contamination, field monitor protective plugs should be removed only for sampling and replaced immediately. The monitor should be opened only in a laboratory.

C-5.3 Thread sealing compounds should not be used under any circumstances.

C-5.4 All metal parts of the sampling apparatus shall be electrically bonded together and grounded.

(*Continued from page* 2)

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R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71 6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76 21 82 92
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